10th Class 2015

Chemistry	Group-II	Paper-II
Time: 2.45 Hours	(Subjective Type)	Marks: 63

(Part-I)

2. Write short answers to any Five (5) questions: 10

(i) What do you mean by equilibrium constant?

Ans At equilibrium rate:

The rate of forward reaction = The rate of reverse reaction

$$k_f [A][B] = k_r [C][D]$$

$$\frac{k_f}{k_r} = \frac{[C][D]}{[A][B]}$$

Where $K_c = \frac{k_f}{k_r}$

K_c is called equilibrium constant. It is represented as:

$$K_c = \frac{[C][D]}{[A][B]}$$

(ii) What is a static equilibrium? Explain with an example.

Ans When reaction ceases to proceed, it is called static equilibrium. For example, a building remains standing rather than falling down because all the forces acting on it are balanced. This is an example of static equilibrium.

(iii) What is difference between Lewis acid and base?

Ans Lewis acid is an acceptor of electron pair *e.g.*, BF_3 while base is a donor of electron pair *e.g.*, NH_3.

(iv) Write down any two properties of bases.

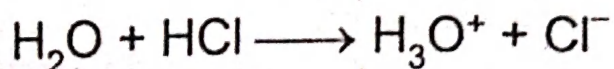
Ans (a) Bases have bitter taste and feel slippery, for example, soap is slippery to touch.

(b) They turn red litmus blue.

(v) Prove that water is an amphoteric specie.

Ans In chemistry, an amphoteric specie is a molecule or ion that can react as an acid as well as a base. Many metals (such as copper, zinc, tin, lead, aluminium and beryllium) form amphoteric oxides or hydroxides.

Water is an amphoteric specie, *i.e.,*

$$H_2O + HCl \longrightarrow H_3O^+ + Cl^-$$

(vi) Define functional group.

Ans An atom or group of atoms or presence of double or triple bond which determines the characteristic properties of an organic compound is known as the functional group.

(vii) Which compounds are called Ketones?

Ans Compounds containing the functional group $>C=O$ are called ketones.

(viii) What is natural gas?

Ans It is a mixture of low molecular mass hydrocarbons. The main component about 85% is methane; along with other gases; ethane, propane and butane.

3. Write short answers to any Six (6) questions: 12

(i) Give difference between saturated and unsaturated hydrocarbon.

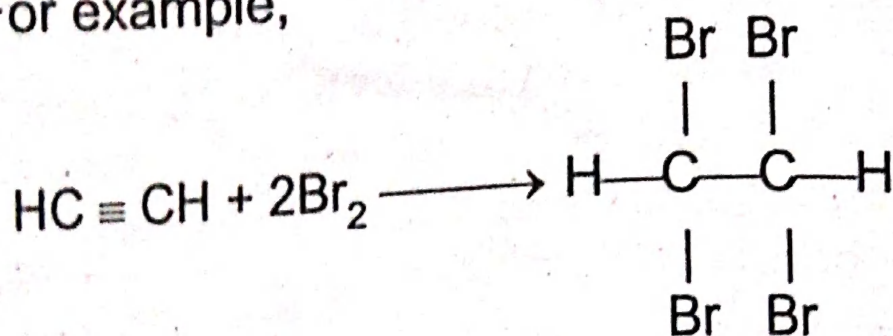
Ans The hydrocarbon in which all the four valencies of carbon atoms are fully satisfied (saturated) by single bonds with other carbon atoms and hydrogen atoms are called saturated hydrocarbons *e.g.,* alkanes. While, the hydrocarbons in which two carbon atoms are linked by a double or a triple bond are called unsaturated hydrocarbons *e.g.,* alkenes, alkynes.

(ii) What are addition reactions? Give example.

Ans Alkynes are reactive compounds because of presence of a triple bond. A triple bond consists of two weak bonds and a strong bond. When alkynes react with other substances, two weak bonds are readily broken one

by one and addition takes place easily. The addition reactions of alkynes resemble to those of alkenes.

For example,

$$HC \equiv CH + 2Br_2 \longrightarrow H-\underset{Br}{\overset{Br}{C}}-\underset{Br}{\overset{Br}{C}}-H$$

(iii) Give two serious effects of Ozone depletion.

Ans (a) Depletion of ozone enables ultraviolet radiations of Sun to reach the Earth, that can cause skin cancer to human beings and other animals.

(b) It can change the life cycle of plants disrupting the food chain.

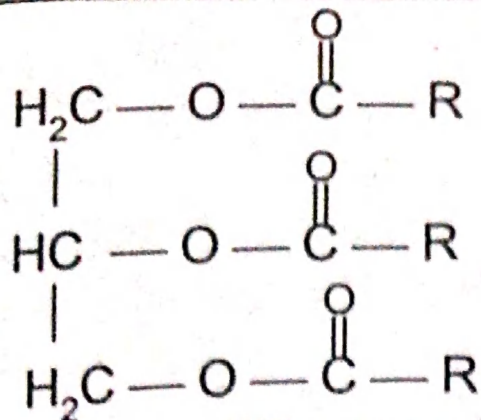
(iv) Give difference between essential and non-essential amino acids.

Ans Ten out of twenty amino acids can be synthesized by human body. Those amino acids are called non-essential amino acids. While the other ten which cannot be synthesized by our bodies are called essential amino acids. Essential amino acids are required by our bodies and must be supplied through diet.

(v) What is meant by triglycerides? Write its general formula.

Ans Lipids are macromolecules made up of fatty acids. Lipids include oils and fats. Oils and fats are esters of long chain carboxylic acids with glycerol. These esters are made of three fatty acids, therefore, they are called triglycerides.

General formula of triglycerides is as under:

$$
\begin{array}{l}
H_2C - O - \overset{\displaystyle O}{\overset{\|}{C}} - R \\
\ \ | \\
HC - O - \overset{\displaystyle O}{\overset{\|}{C}} - R \\
\ \ | \\
H_2C - O - \overset{\displaystyle O}{\overset{\|}{C}} - R
\end{array}
$$

(vi) What is difference between ghee and oil?

Ans Ghee exists in solid form at room temperature. Ghee is also called fats. Fats are triglycerides of saturated fatty acids.

While oils exist in liquid form at room temperature. They are triglycerides of unsaturated fatty acids.

(vii) Write the major sources of CO and CO_2 emission.

Ans Sources of oxides of carbon are as follows:

(a) Both of these gases are emitted due to volcanic eruption and decomposition of organic matter naturally.

(b) The major source for the emission of these gases is combustion of fossil fuels.

(c) Forest fires and burning of wood also emit CO_2 and CO.

(viii) Define greenhouse effect and global warming.

Ans As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect. This effect is proportional to amount of CO_2 in air. Greater is amount of CO_2, more is trapping of heat or warming. Due to increased warming, this phenomenon is called global warming.

(ix) How acid rain increases the acidity of soil?

Ans Acid rain increases the acidity of the soil. Many crops and plants cannot grow properly in such soil. It also increases the toxic metals in the soil that poisons the vegetation. Even old trees are being affected due to acidity of soil. Their growth is retarded. They get dry and die.

4. Write short answers to any Five (5) questions: 10

(i) What is difference between hepatitis and jaundice?

Ans Hepatitis is liver inflammation commonly caused by one of five viruses called hepatitis A, B, C, D and E. Hepatitis A and E can be transmitted by contaminated water.

While Jaundice is caused by an excess of bile pigments in the blood. Liver ceases to function and eyes turn yellow. Patient feels weakness and fatigue.

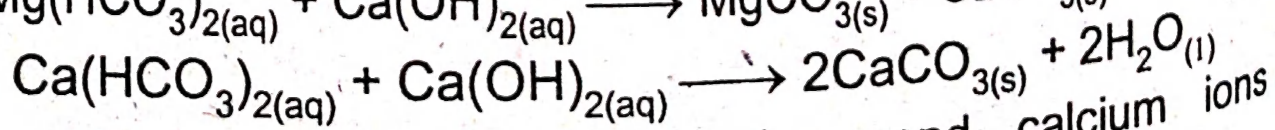
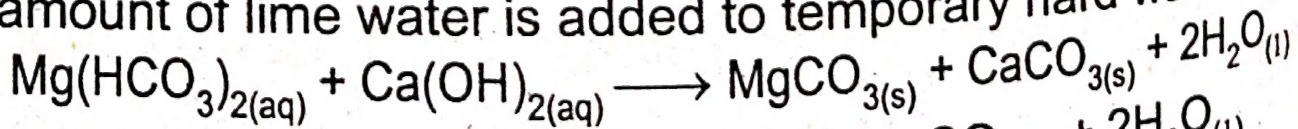
(ii) What is an industrial waste?

Ans All the industrial units discharge their wastes (chemicals and solid materials) either to open ground or to water channels. This is called industrial effluent. The industrial effluent may be highly toxic organic chemicals, inorganic salts, heavy metals, mineral acids, oil and greases, etc.

(iii) How is hardness of water removed by Clark's method?

Ans A chemical method to remove temporary hardness is by the addition of slaked lime $Ca(OH)_2$. A calculated amount of lime water is added to temporary hard water.

$$Mg(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow MgCO_{3(s)} + CaCO_{3(s)} + 2H_2O_{(l)}$$

$$Ca(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow 2CaCO_{3(s)} + 2H_2O_{(l)}$$

Thus, once the magnesium and calcium ions precipitate, our water becomes soft.

(iv) What do you mean by boiler scale? How are they removed?

Ans Hard water is unfit for use in steam engines, boilers and turbines because insoluble calcium and magnesium salts deposit inside. They are called scales. They are bad conductors of heat and hence more fuel is used. Insoluble calcium and magnesium sulphates not only reduce the efficiency of the engine but also cause the boiler to burst.

(v) What is principle of fractional distillation?

Ans The crude oil is refined in the refineries. Refining process is the separation of crude oil mixture into various useful products (fractions). It is carried out by a process called fractional distillation.

(vi) Define petroleum.

Ans It is a complex mixture of several gaseous liquid and solid hydrocarbons having water, salts and earth particles with it.

(vii) What is difference between Minerals and Ores?

Ans The solid natural materials found beneath the Earth's surface, which contains compounds of metals in the combined state along with earthly impurities, are called minerals.

While, those minerals from which the metals are extracted commercially at a comparatively low cost with minimum effort are called ores of the metals.

(viii) What do you mean by calcination?

Ans Calcination is used to mean a thermal treatment process in the absence or limited supply of air or oxygen applied to ores and other solid materials to bring about a thermal decomposition, phase transition or removal of a volatile fraction.

(Part-II)

NOTE: Attempt any Three (3) questions.

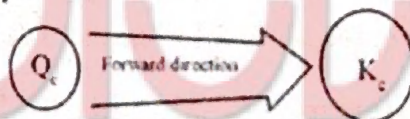
Q.5.(a) What is importance of equilibrium constant?(4)

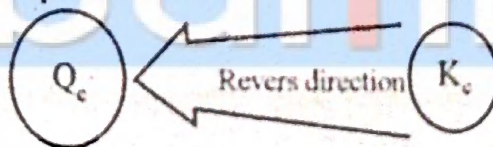
Ans Knowing the numerical value of equilibrium constant of a chemical reaction, direction as well as extent of the reaction can be predicted.

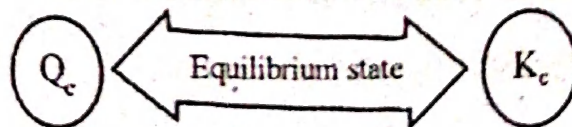
(i) Predicting direction of a reaction:

Direction of a reaction at a particular moment can be predicted by inserting the concentration of the reactants and products at that particular moment in the equilibrium expression. We can make the following generalization about the direction of the reaction.

If $Q_c < K_c$

The reaction goes from left to right, *i.e.*, in forward direction to attain equilibrium.

If $Q_c > K_c$

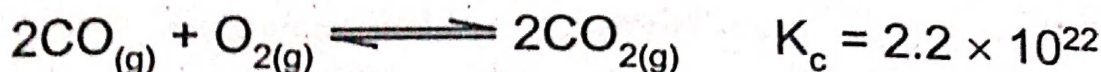
The reaction goes from right to left, *i.e.*, in reverse direction to attain equilibrium.

If $Q_c = K_c$

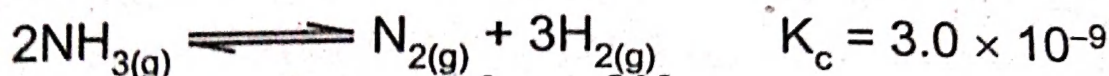
Forward and reverse reactions take place at equal rates, *i.e.*, equilibrium has been attained.

(ii) Predicting Extent of a Reaction:

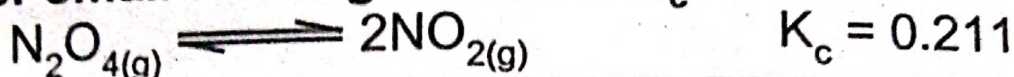
Numerical value of the equilibrium constant predicts the extent of a reaction. It indicates to which extent reactants are converted to products. In fact, it measures how far a reaction proceeds before establishing

equilibrium state. In general, there are three possibilities of predicting extent of reactions as explained below.

Large numerical value of K_c

$$2CO_{(g)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)} \qquad K_c = 2.2 \times 10^{22}$$

Small numerical value of K_c

$$2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)} \qquad K_c = 3.0 \times 10^{-9}$$

Neither small nor large value of K_c

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)} \qquad K_c = 0.211$$

(b) Write short note on indicators. (3)

Ans Indicators are the organic compounds. They have different colours in acidic and alkaline solutions. Litmus is a common indicator. It is red in acidic solutions and blue in alkaline solutions.

Each indicator has a specific colour in acidic medium which changes at a specific pH to another colour in basic medium. For example, phenolphthalein is colourless in strongly acidic solution and red in strongly alkaline solution. It changes colour at a pH of about 9. This means phenolphthalein is colourless in a solution with pH less than 9. If the pH is above 9, phenolphthalein is red.

Q.6.(a) Write down characteristics of homologous series. (4)

Ans Organic compounds are divided into groups of compounds having similar chemical properties. Each group is known as a homologous series. Organic compounds of the same homologous series have the following characteristics in common:

(i) All members of a series can be represented by a general formula. For example, general formula of alkanes, alkenes, and alkynes are C_nH_{2n+2}, C_nH_{2n} and C_nH_{2n-2}, respectively.

(ii) Successive members of the series differ by one unit of $-CH_2-$ and 14 units in their relative molecular mass.

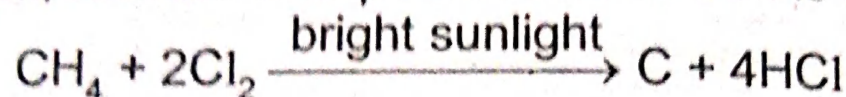
(iii) They have similar chemical properties.

(iv) There is a regular change in their physical properties, the melting and boiling points increase gradually with the increase of molecular masses.

(v) They can be prepared by similar general methods.

(b) Write a note on halogenation of alkanes. (3)

Ans Alkanes react fairly with halogens in diffused sunlight only. In dark, there is no reaction. In direct sunlight, reaction is explosive and carbon is deposited.

$$CH_4 + 2Cl_2 \xrightarrow{\text{bright sunlight}} C + 4HCl$$

In diffused sunlight, a series of reactions take place and at each step one hydrogen atom is substituted one by one by halogen atoms.

$$CH_4 + Cl_2 \xrightarrow[\text{sunlight}]{\text{diffused}} CH_3Cl + HCl$$

Chloromethane

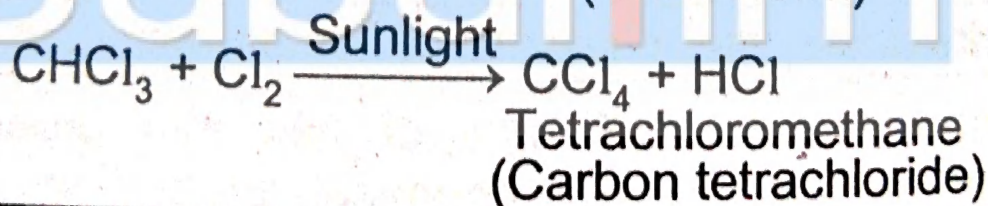
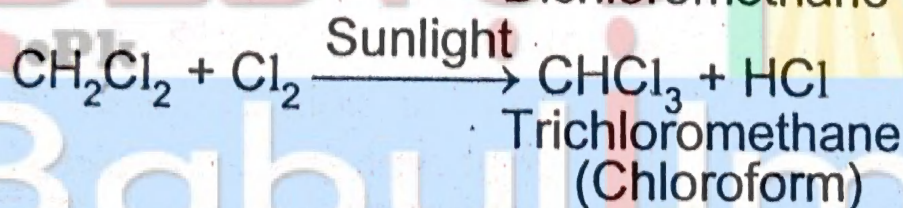
$$CH_3Cl + Cl_2 \xrightarrow{\text{Sunlight}} CH_2Cl_2 + HCl$$

Dichloromethane

$$CH_2Cl_2 + Cl_2 \xrightarrow{\text{Sunlight}} CHCl_3 + HCl$$

Trichloromethane (Chloroform)

$$CHCl_3 + Cl_2 \xrightarrow{\text{Sunlight}} CCl_4 + HCl$$

Tetrachloromethane (Carbon tetrachloride)

Q.7.(a) Write the uses and sources of carbohydrates. (4)

Ans **Sources and Uses of Carbohydrates:**

Carbohydrates range from simple to complex ones. They have varied sources and uses. Sources of simple sugars: glucose, fructose and galactose are fruits, vegetables, honey and cereals.

Disaccharides are sucrose, lactose and maltose. Sucrose is found in sugar beet, sugar-cane and fruits.

Lactose consisting of glucose and galactose is the main sugar in milk and dairy products.

Maltose, a disaccharide of two glucose molecules, is found in cereals.

Polysaccharides are starch and cellulose. Starch is found in cereal crops; wheat, barley, maize, rice, etc. Cotton is pure cellulose.

Our body uses carbohydrates in the form of glucose. Glucose is the only form of carbohydrates that is used directly by muscles for energy. It is important to note that brain needs glucose as an energy source, because it cannot use fat for this purpose.

Besides, the energy providing materials, carbohydrates also provide the following usage to our body:

(i) They regulate the amount of sugar level in our body. Low sugar level in body results in hypoglycemia.

(ii) They provide essential nutrients for bacteria in intestinal tract that helps in digestion.

(iii) Dietary fibre helps to keep the bowel functioning properly.

(iv) Fibre helps in lowering of cholesterol level and regulates blood pressure.

(v) Carbohydrates protect our muscles from cramping.

(b) Write the effects of acid rain. (3)

Ans **Effects of Acid Rain:**

(i) Acid rain on soil and rocks leaches heavy metals (Al, Hg, Pb, Cr, etc.) with it and discharges these metals into rivers and lakes. This water is used by human beings for drinking purpose. These metals accumulate in human body to a toxic level. On the other hand, aquatic life present in lakes also suffers

because of high concentration of these metals. Especially high concentration of aluminium ions clogs the fish gills. It causes suffocation and ultimately death of fish.

(ii) Acid rain attacks the calcium carbonate present in the marble and limestone of buildings and monuments. Thus, these buildings are getting dull and eroded day by day.

(iii) Acid rain increases the acidity of the soil. Many crops and plants cannot grow properly in such soil. It also increases the toxic metals in the soil that poison the vegetation. Even old trees are being affected due to acidity of soil. Their growth is retarded. They get dry and die.

(iv) Acid rain directly damages the leaves of trees and plants, thus limiting their growth. Depending upon the severity of the damage, plants growth can be hampered. Plants' capability to resist cold or diseases reduces and they ultimately die.

Q.8.(a) Write any four properties of water. **(4)**

Ans **Following are the four properties of water:**

(i) It is neutral to litmus.

(ii) Its freezing point is 0°C and boiling point is 100°C at sea level.

(iii) Its maximum density is 1 g cm^{-3} at 4°C.

(iv) It is excellent solvent for ionic as well as molecular compounds.

(b) Explain electro-refining process of copper. **(3)**

Ans The process of refining of metals is called as 'electrolysis'. For example, the refining of copper is done in an electrolytic tank. The electrolytic tank contains

copper sulphate solution. It consists of two electrodes *i.e.*, anode (impure copper metal) and cathode (pure copper metal). When current is passed through the solution, anode forms Cu^{2+} ions. These Cu^{2+} ions are discharged by getting electrons from cathode. In this way, copper atoms are deposited on cathode and become thick blocks of copper as shown in the figure.

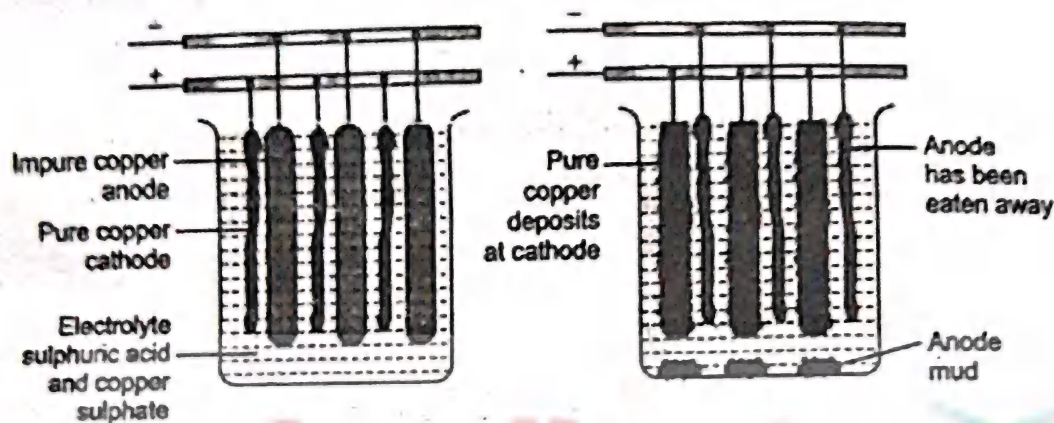



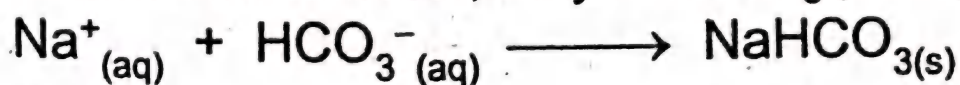
Fig. 16.6 Electro-refining of copper.

In this process, impure copper from the anode dissolves and goes into copper sulphate solution. Side by side, pure copper ions from the solution deposit on cathode. Thus the copper becomes pure copper metal. The impurities like gold and silver settle down as anode mud.

Q.No.9.(a) Write a detailed note on Ammonia Solvay process. (4)

Ans **Manufacture of Sodium Carbonate by Solvay's Process:**

Principle of Solvay's process lies in the low solubility of sodium bicarbonate at low temperature *i.e.*, at 15°C. When CO_2 is passed through an ammoniacal solution of NaCl called ammoniacal brine, only $NaHCO_3$ precipitates.

$$Na^+_{(aq)} + HCO_3^-{}_{(aq)} \longrightarrow NaHCO_{3(s)}$$

Raw Materials:

The raw materials needed for this process are cheap and easily available. They are in abundance, such as:

(i) Sodium chloride (NaCl) or brine.
(ii) Limestone ($CaCO_3$).
(iii) Ammonia gas (NH_3).

Basic Reactions:

The process consists of the following steps:

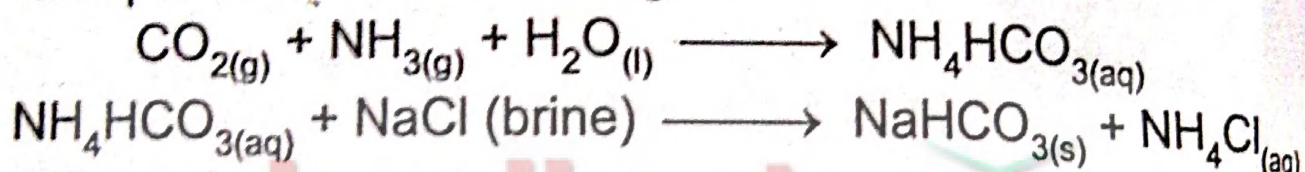
(i) Preparation of ammoniac brine:

First of all, ammoniac brine is prepared by dissolving ammonia gas in sodium chloride solution (brine).

(ii) Carbonation of ammoniac brine:

Ammoniac brine is fed into carbonating tower and carbon dioxide is passed through it. Following reactions take place in the carbonating tower:

$$CO_{2(g)} + NH_{3(g)} + H_2O_{(l)} \longrightarrow NH_4HCO_{3(aq)}$$

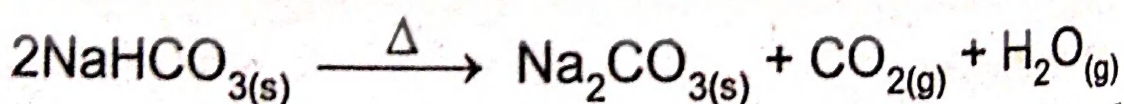
$$NH_4HCO_{3(aq)} + NaCl\text{ (brine)} \longrightarrow NaHCO_{3(s)} + NH_4Cl_{(aq)}$$

The temperature of the mixture is lowered to 15°C and precipitates of $NaHCO_3$ are obtained.

(iii) Filtration of precipitates:

The milky solution from the carbonating tower is filtered to get sodium bicarbonate. It is used as a baking soda.

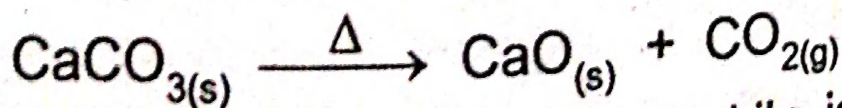
(iv) Calcination:

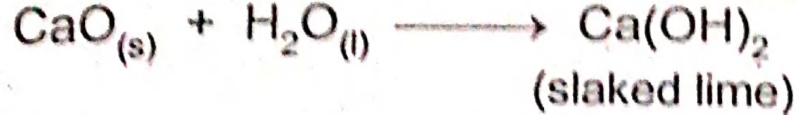
Sodium bicarbonate is heated to get sodium carbonate:

$$2NaHCO_{3(s)} \xrightarrow{\Delta} Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$$

CO_2 is again used in tower. It is about half of CO_2 needed in the process.

(v) Preparation of carbon dioxide and slaked lime:

CO_2 is prepared by heating limestone in a lime kiln. Then it is carried to carbonating tower:

$$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$$

Quick lime (CaO) formed in lime kiln is slaked with water. Then, it is pumped to the ammonia recovery tower.

$$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_2$$
(slaked lime)

(vi) Ammonia recovery tower:

Ammonia is recovered in this tower from ammonium chloride solution produced in the carbonated tower and calcium hydroxide formed in lime kiln.

$$2NH_4Cl_{(aq)} + Ca(OH)_{2(aq)} \longrightarrow 2NH_{3(g)} + CaCl_{2(aq)} + 2H_2O_{(l)}$$

In fact, all ammonia is recovered in this tower and is reused in the process. There are minor losses of ammonia in the process which are compensated by using some fresh ammonia.

(b) What are primary and secondary pollutants? Explain with examples. (3)

Ans Pollutants:

A pollutant is a waste material that pollutes air, water or soil.

Types of pollutants:

Major pollutants are classified as primary pollutants and secondary pollutants.

Primary pollutants:

Primary pollutants are the waste or exhaust products driven out because of combustion of fossil fuels and organic matter. These are oxides of sulphur (SO_2 and SO_3), oxides of carbon (CO_2 and CO), oxides of nitrogen (especially nitric oxide NO), hydrocarbon (CH_4), ammonia and compounds of fluorine.

Secondary pollutants:

Secondary pollutants are produced by various reactions of primary pollutants. These are sulphuric acid, carbonic acid, nitric acid, hydrofluoric acid, ozone and peroxy acetyl nitrate (PAN).

(Part-III)

(Practical Part)

Note: Attempt any Two (2) questions.

A-(i) Write the materials required to standardize NaOH solution. **(2)**

Ans Beakers, burette, pipette, funnel, conical flask, iron stand, 0.1 M HCl, NaOH solution, phenolphthalein, distilled water, etc.

(ii) Write procedure of experiment to identify metal ions through flame test. **(3)**

Ans **Procedure:**

(i) Take the platinum or nichrome wire and make a small loop of it.

(ii) Dip it in concentrated HNO_3 and then heat it in an oxidizing blue flame till the wire imparts no colour.

(iii) Take a small amount of a salt on the watch glass with the help of spatula and add a few drops of concentrated HCl on it. Stir it with a glass rod to make a uniform thick paste. Wait until the given salt is converted into its chloride.

(iv) Take a little of this paste on the loop of the nichrome wire and hold it in an oxidizing / blue flame. The wire should be heated at the top of the flame. HCl paste is required only if the salt used is other than chloride.

(v) Note the characteristic colour of the flame imparted by the metal ion.

(vi) Wash the nichrome wire with concentrated HCl and heat it on the flame till no characteristic colour is imparted to the flame.

(vii) Repeat the experiment with other salts in the same manner

(viii) Record the colour of the flame imparted by a particular metallic ion.

B-(i) Write the materials required to identify carboxylic acid with sodium carbonate. (2)

Ans **Apparatus:**

Test tubes, test tube holder, test tube rack, spatula, burner, matchbox, delivery tube, corks.

(ii) Write the procedure to identify Aldehyde with Fehling solution. (3)

Ans For Answer see Paper 2015 (Group-I), B-(i).

C-(i) Write down the apparatus required to demonstrate softening of water by removal of calcium and magnesium ions from hard water. (2)

Ans **Apparatus:** Test tubes, beaker, distilled water.

(ii) Describe the procedure to demonstrate that sugar decomposes into elements or other compounds. (3)

Ans For Answer see Paper 2015 (Group-I), C-(ii).